# Florida GIS Speeds Oil Spill Response

In the past, coastal resource managers responding to an oil spill relied on paper maps to make response decisions, which could be cumbersome and time consuming. The State of Florida has developed a powerful geographic information system (GIS)-based application that has proven to be an effective tool in helping decision makers prioritize response and cleanup efforts.

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**Henry Norris, Florida Marine Research Institute**

The Florida Marine Spill Analysis System (MSAS) "is designed to address five aspects of oil spill response – contingency planning, on-scene spill tracking and analysis, long-term monitoring, damage assessment, and general GIS data management as it pertains to oil spills," says Henry Norris, MSAS developer for the Florida Marine Research Institute.

He notes the application lets decision makers see in near real time "where the spill is, how it has progressed over time, and how much environmental damage has potentially occurred." The MSAS is capable of importing and displaying the results of the National Oceanic and Atmospheric Administration's (NOAA) Office of Response and Restoration (ORR) spill trajectory models, displaying them, and analyzing future damage. It also creates "a log file that documents an oil spill, which becomes the spill's historical file."

Norris says the MSAS grew out of the Florida legislature's decision in 1991 to update and "automate" the state's Environmental Sensitivity Index (ESI) Atlas. ESIs are traditionally NOAA ORR paper maps of the nation's shoreline that use standardized color symbols to indicate the location of sensitive coastal resources, such as mangrove forests and turtle nesting sites.

"When we were given the directive to do it," he says, "we decided to build a GIS application to more easily keep the maps up to date." The application was to be developed for use by the Florida Department of Environmental Protection's Bureau of Emergency Response and the U.S. Coast Guard, which coordinate activities to manage a marine spill in the state.

"We decided to take a two-pronged approach," Norris says. First, Florida contracted with Research Planning, Incorporated in Columbia, South Carolina to update and make GIS layers out of the state's ESI maps. Second, they contracted with the Environmental Systems Research Institute (ESRI®) to develop an oil spill application in ARC/INFO® running on UNIX® workstations. The resulting application, delivered in July 1993, was the MSAS prototype that contained over 30 natural resource and spill response-related databases on the Florida Keys.

Less than a month later, three vessels collided in Tampa Bay, creating a slick 17 miles long and 2.5 miles wide. "We had an oil spill application, but it only had data on the Keys," Norris recalls. Within days, various Tampa Bay maps and charts were scanned, integrated, and rectified to create ESI maps showing the location of natural resources in the path of the spill. These were hand delivered to the Coast Guard command center so that responding agencies could work off the same information to formulate response plans.

"We were hand carrying maps across the parking lot to the Coast Guard. If the spill had happened anywhere else we would have had to express mail the maps, which would have taken at least a day, and that would have been too late," Norris says. "We realized the application needed to be portable."

While the MSAS proved itself to be quite successful during the spill, he says they also noticed other shortcomings. "The system was so complicated it needed a GIS specialist to run, so we recognized that it needed to be easier to use, and it needed to be faster. It took us down a whole new road of thinking."

The Florida Marine Research Institute again approached ESRI, but this time they wanted an application that would run in desktop GIS ArcView® 2.1, which is "a more intuitive system," making it easier to use, he says. "Now we had something that was PC-based and portable. We could put it on a laptop and take it anywhere, and it was also easier to use. But we found it wasn't a stable system, and we lost a lot of functionality and speed. We'd solved the portability and ease-of-use problems, but we had gone backwards with loss of function and speed."

ESRI solved the function problem when it came out with ArcView 3.Oa, which "worked much better. It was portable, had the ease of use, and had far more true GIS capabilities," he says. The new Pentium® laptop computers solved the speed problems.

In 1996, laptop computers loaded with MSAS were sent to all the Bureau of Emergency Response field offices, and personnel were trained to use ArcView and MSAS. Norris says in the event of a major spill, Florida Marine Research Institute staff are deployed to the site. "We go down and set up shop in the spill response command center. We'll bring the MSAS loaded on a powerful Pentium II® machine and a 36-inch color plotter and printer. The laptop becomes our backup. We expect that we can get anywhere in the state and be set up and running within 24 hours."

Norris says during a spill, they hook the computer up to a projector so the maps can be "shown on the wall. It shows spill tracking, and locations of the skimmers and booms. All the data that are in the GIS can be projected on the wall."

The system uses baseline imagery that includes ESI maps, nautical charts, and digital orthophoto quarter quadrangles that have been scanned and edgedmapped for the entire state. "You just drop the spill data on top of them," Norris says. "It's great because in an oil spill, it's hectic, people are scurrying around, and you're crammed into a desk in the corner. The data comes from someone who has just flown the spill, and they might have something scribbled on a nautical chart showing the extent of the spill, and that's what they give us. We do heads-up digitizing, where we eyeball the data and trace it on the screen to create a data layer. Because of cramped conditions and the hectic nature you need to do things very fast."

Norris says one of the most powerful aspects of the MSAS is that it "enables you to keep track of multiple spill boundaries and their changing states over time. MSAS could handle a 100-vessel collision, theoretically, and each vessel could be losing different oils. You could load all the data in, keep them separate, and track all of them, assuming the humans can keep them separate." He adds, "It could show you where every ship was every hour. It would give you a chronicled record of multiple vessels an~d multiple oil types, and the different states of oil over time. That's the core strength of the MSAS."

Another benefit of the application is "keeping the environmental resources at the front of the Coast Guard's minds when they're making response decisions," Norris says. "You can cookie cutter down through the data layers and do a damage assessment to see that 2,000 acres of mangrove have been impacted by the sheen, or get the linear feet of shoreline affected."

Using the NOAA ORR spill trajectory models helps decision makers get a "snapshot of where the oil is going and what resources are going to be affected so they can prioritize where to deploy the equipment," he says. "Plus, the GIS contains information on where boat ramps and marinas are located to assist with that deployment."

Because MSAS has proven its value for minimizing spill impacts anywhere, Norris says the application has received a lot of interest from other states. The agency "saw a way to tie the interest of other states with an ongoing mechanism for continuously upgrading and improving the application."

To accomplish this, Florida partnered with the NOAA Coastal Services Center and ORR, and the Minerals Management Service to develop a management plan for MSAS. Norris says under the plan, "NOAA will manage the core set of MSAS tools and deploy free copies of the application to other states. If a partner develops a new tool or function, then that tool goes into the corporate box for all the states to use."

Norris says the management plan would ensure the use of "nationally consistent data, which has other uses, such as analyzing algal blooms, chlorine spills, or any kind of environmental analysis. It would be very synergistic. Everyone puts a little in and gets a lot out of it. Florida is just putting in the first piece. The plan holds significant potential to leverage small funding contributions for significant enhancement to the application."

*For more information on MSAS or the management plan, point your browser to www.csc.noaa.gov/products/msas. You may also contact Steve Meador at the NOAA Coastal Services Center, (843) 740-1334, or smeador@csc.noaa.gov.*